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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/694,290

10/27/2003

Bernhard Ulrich Koelle

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10/31/2006

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EXAMINER

NGUYEN, PHILLIP

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/694,290	<b>Applicant(s)</b> KOELLE ET AL.	
	<b>Examiner</b> Phillip Nguyen	<b>Art Unit</b> 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 11 September 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Response to Arguments***

1. Applicant's arguments with respect to claims 1-22 have been considered but are moot in view of the new ground(s) of rejection.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1, 3-8, 10-11, 13-15, 17-19, and 21-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Hwang et al. (US Publication No. 20030185267).

With respect to claims 1 and 15, Hwang discloses in Fig. 1 a vertical cavity surface-emitting laser (VCSEL) operable to generate single-mode laser light at an operative wavelength (abstract), comprising: a light-emitting surface (top surface of the active region or top surface of upper mirror); and a monolithic longitudinal stack structure including a first mirror 121 having an optical reflectivity R1 for light at the operative wavelength, a second mirror 148 having an optical reflectivity R2 for light at the operative wavelength, wherein R1 and R2 have different respective values one of which is greater than 99.9% and another of which is less than 99.7% (paragraphs 0020 and 0041) and , a cavity region disposed between the first mirror and the second mirror and including an active light generation region 141 and a cavity extension region 122 and/or 160; wherein the longitudinal stack structure further includes an ion-implanted current confinement region 150 characterized by a peak longitudinal implant concentration separated from the cavity region by a longitudinal distance greater than 0.5  $\mu\text{m}$ . It is noted that

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the Hwang discloses the thickness of spacer 160 is about 0.25 to 2  $\mu\text{m}$  (paragraph 0043) and the thickness of the current confinement region 150 maybe about 250 to 3000 Angstroms which is equivalent to 0.025 to 0.3  $\mu\text{m}$  where the layer 150 is positioned in the upper half of the spacer 160. In case of the thickness of the spacer 160 is about more than 1  $\mu\text{m}$ , the longitudinal distance must be greater than 0.5  $\mu\text{m}$ . Since the Hwang discloses the product, it is inherent product by process for performing the method of manufacturing the same product.

With respect to claim 3, Hwang further discloses the R1 121 and R2 148 are at least 99.5% (paragraphs 0020 and 0041).

With respect to claims 4-5, 8, 17 and 19, Hwang discloses the spacers 122 and 160 each being 0.25 to 2  $\mu\text{m}$ . Therefore the total thickness of the cavity extension region maybe up to 4  $\mu\text{m}$  which is greater than twice and less than 20 times the operative wavelength which is about 1.5  $\mu\text{m}$ , and also maybe equal to an integral of an multiple of one-half of the operative wavelength which is at least about 3  $\mu\text{m}$ .

With respect to claims 6 and 18, in this case only one spacer 122 or 160 is interpreted as the cavity extension region which has the thickness of 0.25 to 2  $\mu\text{m}$  while the active region has a thickness of 0.1 to 0.2  $\mu\text{m}$ . Therefore the cavity region without one of the cavity extension region will be the total thickness of the active region and the thickness of one of the spacer which maybe substantially equal to the operative wavelength which is about 1.5  $\mu\text{m}$ . Hwang further discloses a respective stack of alternating layers of different refractive index materials each having a longitudinal optical thickness substantially equal to one-quarter of the operative wavelength (paragraph 0041).

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With respect to claim 7, it is clearly shown in the Fig. 1 that the cavity extension region 160/122 is adjacent to one of the alternating layers of the first and second mirrors.

With respect to claim 10, Hwang discloses the cavity extension region 160 is disposed between the active light generation region 141 and the second mirror 148.

With respect to claim 11, Hwang discloses a first portion 122 of the cavity extension region is adjacent to the first mirror 121 and a second portion 162 of the cavity extension region is adjacent to the second mirror 148.

With respect to claim 13, Hwang discloses the current confinement region defines a current aperture 152 with a diameter of less than 12  $\mu\text{m}$  (3  $\mu\text{m}$  in paragraph 0054).

With respect to claim 14, Hwang discloses the claimed invention as shown in the rejection of claim 1 and further the laser array using the same claimed laser (paragraph 0035).

With respect to claim 21, Hwang discloses the current confinement region is a damaged region of the longitudinal stack structure by implanting the ions or protons.

With respect to claim 22, Hwang discloses the implanting comprises implanting protons in the current confinement region (paragraph 0023).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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3. Claims 2, 9, 16, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang et al. (US Publication No. 20030185267) in view of Sun (US Patent No. 6144682).

With respect to claims 2 and 16, Hwang discloses the claimed invention except for a metal contact disposed on the light emitting surface and defining an aperture, wherein the ion-implanted current confinement region defines a current aperture larger than the aperture of the metal contact. Sun discloses in Fig. 1a VCSEL with an implantation region 114 defining a current confinement region and further two a metal contact 142 disposed on the light emitting surface and defining an aperture, wherein the ion-implanted current confinement region defines a current aperture 120 larger than that of the metal contact 134. It would have been obvious to the one having ordinary skill in the art at the time the invention was made to provide a metal contact defining the aperture smaller than that of the current aperture in order to reduce the higher modes of the VCSEL.

With respect to claims 9 and 20, Sun discloses the implanted region 116 and the mirror 114 being made of AlGaAs and AlAs which is the same material composition as that of the implanted region.

4. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang et al. (US Publication No. 20030185267) in view of Hwang (US Publication No. 20030091083). Hwang discloses the claimed invention but being silent of teaching a longitudinal distance is greater than three times the longitudinal straggle. Hwang ('083) discloses in Fig. 4-7 a VCSEL with ion-implanted current-confinement structure and further discloses the longitudinal distance between the peak implant concentration being separated from the cavity region by a greater distance than the longitudinal straggle as much as 0.5  $\mu\text{m}$ . For the improvement the laser with implantation, it

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would have been obvious to the one having ordinary skill in the art at the time the invention was made to provide the longitudinal distance greater than three times the longitudinal straggle as taught by Hwang ('083) to avoid damage the active region due to the large longitudinal straggle when implanting (paragraph 0021).

***Communication Information***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip Nguyen whose telephone number is 571-272-1947. The examiner can normally be reached on 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MINSUN HARVEY, can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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ARMANDO RODRIGUEZ  
PRIMARY EXAMINER